



InDev

IN-DEPTH UNDERSTANDING OF ACCIDENT CAUSATION FOR VULNERABLE ROAD USERS

Validation of surrogate traffic safety indicators

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Outline

- Part 1
- What do we mean by validation?
- Product validation
 - Previous product validation
- Process validation
 - Previous process validation
- Part 2
- Product validation in InDeV

What do we mean by validation?

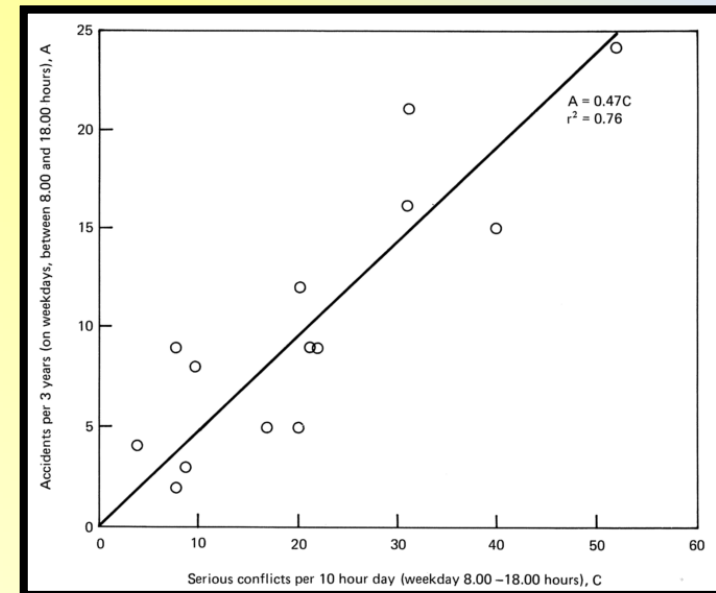
- Does an indicator actually “measure” the property you want to measure
- Validity of an indicator means to what extent it describes (un)safety
- Relation between accidents and conflicts

Product validation

- Correlation between conflicts and accidents
- Number of observed or expected conflicts
- Number of recorded or expected accidents

Previous product validation

- Linear correlation
- Number of reported accidents
- Number of observed conflicts



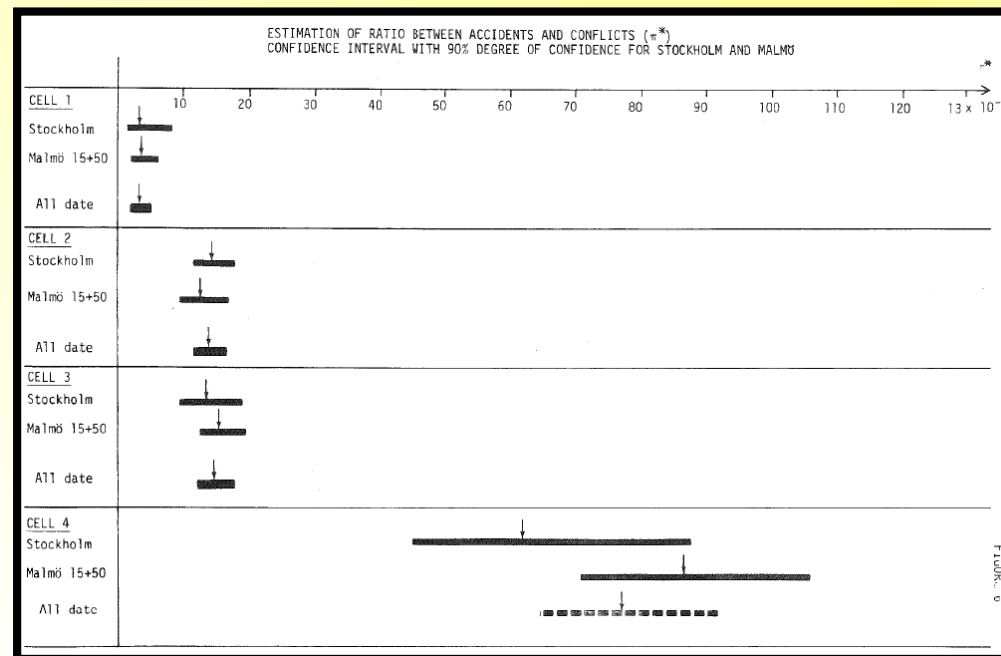
(TRRL, 1980)

Previous product validation

- *Hauer and Gårder (1986)*
- Variance of the Accident-to-conflict ratio, $\text{VAR}(\pi)$
 - *Conflicts * π = Accidents*
- “a technique (method, device) for the estimation of safety is “valid” if it produces unbiased estimates, the variance of which is deemed to be satisfactory.”

Previous product validation

- Focusing on the variance of the Accident-to-conflict ratio



(Hydén, 1977)

Previous product validation

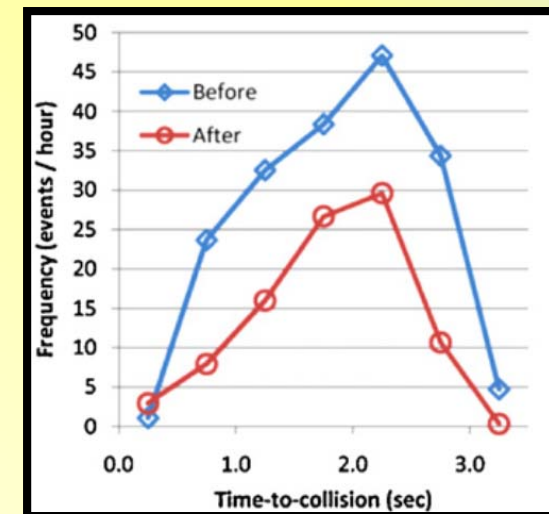
- Linear correlation
 - *Lord (1996)*
- Estimate the expected number of accidents using an accident prediction model
- Number of observed conflicts

Previous product validation

- *El-Basyouny & Sayed (2013)*
 - *Two-phase model*
- Predict expected conflict rate using traffic volume, area type etc.
- Predicted conflict rate used as input for negative binomial safety performance function

Previous product validation

- Before-after approach
 - *Autey et al. (2012)*
- Before-after conflict study
 - *Sacchi et al. (2016)*
- Collision-based full Bayes before–after safety evaluation



(Autey et al., 2012)

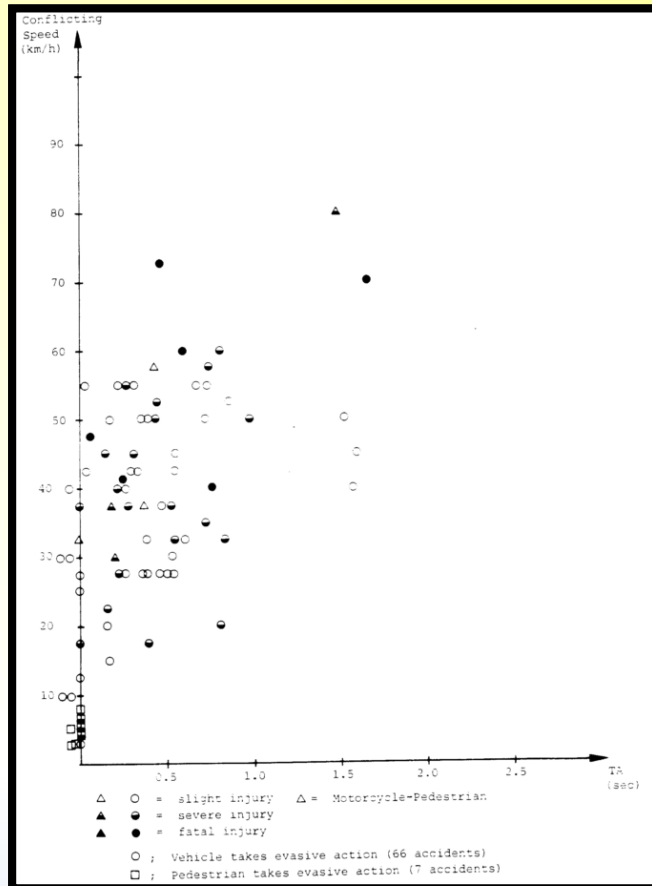
Process validation

- Indicates the extent to which safety indicators can be used for describing the process that leads to accidents

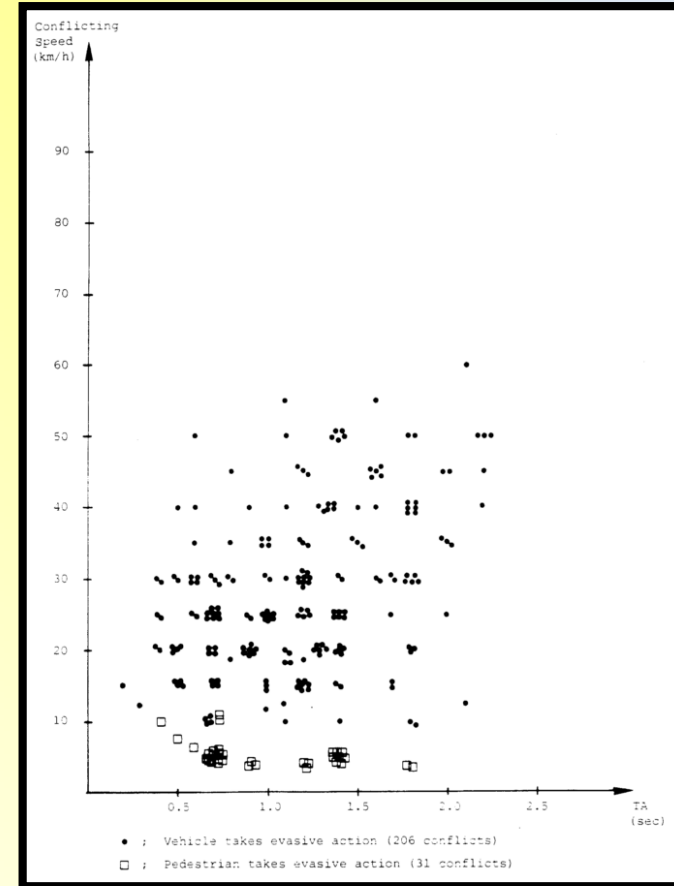
Process validation

- In-depth accident studies or accident investigations by the police
 - Brake-marks measured
 - interviews with involved road users and witnesses
- Compare "process" between accidents and conflicts

Previous process validation



(Hydén, 1987)

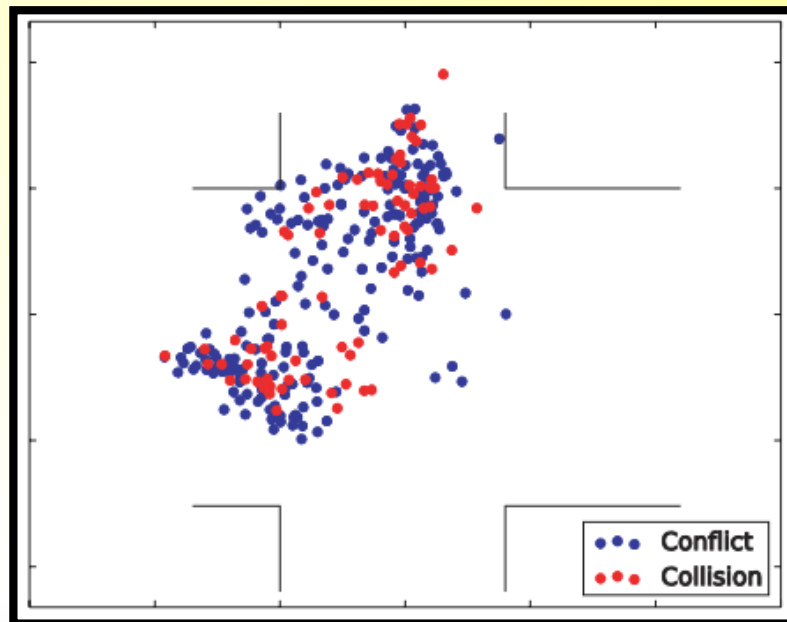


(Hydén, 1987)

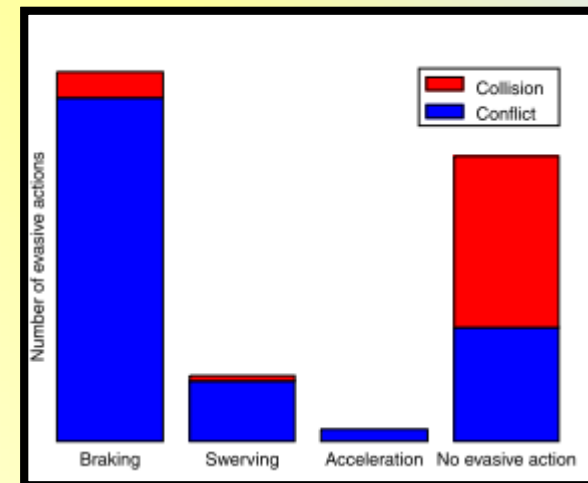
Previous process validation

- Video recorded accidents
- Compare event leading to accidents compared to events leading to conflicts

Previous process validation



(Saunier et al., 2011)



(Saunier et al., 2011)



InDeV

IN-DEPTH UNDERSTANDING OF ACCIDENT CAUSATION FOR VULNERABLE ROAD USERS

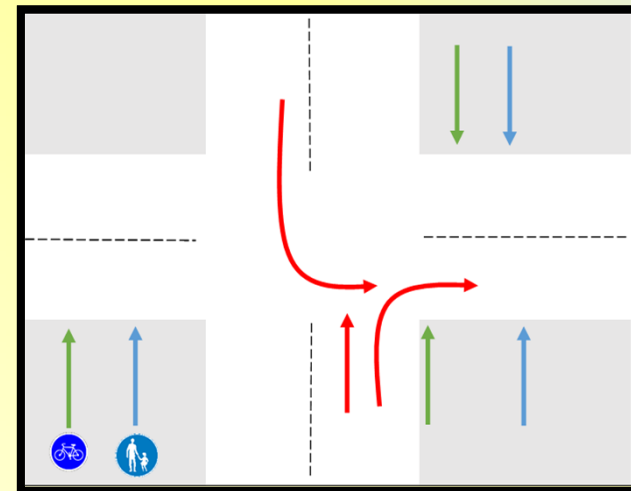
Part 2

Product validation in InDeV



Product validation in InDeV

- 21 signalized intersections in 6 countries
 - Spain, Sweden, Denmark, Belgium, the Netherlands and Poland
 - 3 weeks of filming
- Focus on pedestrians and bicyclists
- Manoeuvre specific
 - Low number of recorded accidents

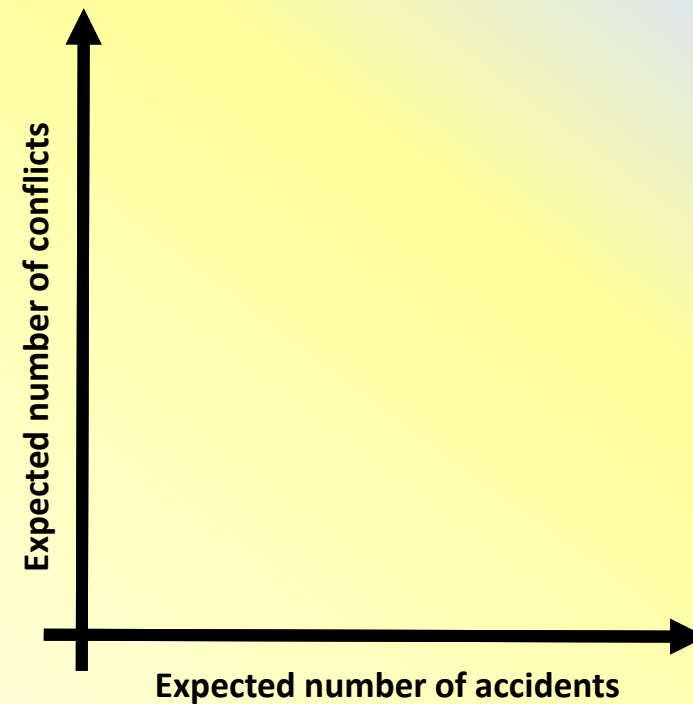


Product validation in InDev

- Similar approach to *Lord (1996)*
- Expected number of accidents
 - Adapt safety performance function (SPF)
 - Nation and manoeuvre specific
- Expected the number of conflicts
 - Based on observed conflicts
- Focus on the variance of the Accident-to-conflict ratio

Product validation in InDev

- Comparison of two different methods to estimate safety.





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Thank you very much for your attention!

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Product validation in InDeV

- Suggested accident model in InDeV

$$- E(\text{accidents}) = \alpha * Flow_{MV}^{\beta 1} * Flow_{VRU}^{\beta 2}$$

- $\beta 1$ & $\beta 2$ will be estimated based on literature

Satisfactory validation

- *Güttinger (1979)*
 - The relation between serious *conflicts* and accidents must be stronger than the relation between *traffic volume* and accidents.
 - The relation between serious *conflicts* and accidents must be stronger than the relation between *people's opinion* regarding road safety and accidents.